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PROBLEMS AND OPPORTUNITIES FOR THE MATURING ENGINEER.(U)
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UNCLASSIFIED TR-ONR-6 NL

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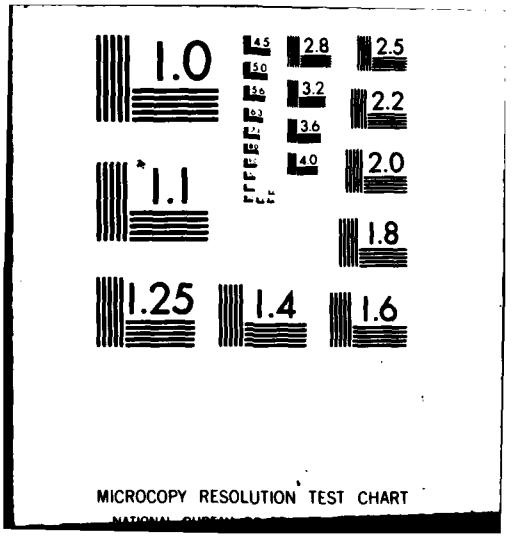
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER TR-ONR-6	2. GOVT ACCESSION NO. A117534	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Problems and Opportunities for the Maturing Engineer		5. TYPE OF REPORT & PERIOD COVERED Interim Technical Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Lotte Bailyn		8. CONTRACT OR GRANT NUMBER(s) N00014-80-C-0905
9. PERFORMING ORGANIZATION NAME AND ADDRESS Sloan School of Management Massachusetts Institute of Technology 50 Memorial Drive, Cambridge, MA 02139		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NR 170-911
11. CONTROLLING OFFICE NAME AND ADDRESS Office of Naval Research Organizational Effectiveness Group (Code 442) Arlington, VA 22217		12. REPORT DATE June, 1982 13. NUMBER OF PAGES 14
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) Office of Naval Research Resident Representative M.I.T. - E19-628 Cambridge, MA 02139		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release.

DTIC ELECTE JUL 26 1982 S A

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

This paper is based on a presentation at Electro/82, May 25, 1982, Boston, Massachusetts.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Engineering Careers
Mid-Career Professionals
Work Stagnation
Reward Systems for Professionals

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This paper discusses the problems of maturing engineers in terms of two opposing myths about them, an academic myth and an industrial myth. It argues that both myths lead to procedures that cause stagnation in engineering careers. It describes stagnation in terms of four typical characteristics of engineering jobs, and suggests that organizations might overcome this problem by changing their policy of work assignments and by developing appropriate career paths and rewards for technical professionals.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

ONR
N00014-80-C-0905
NR 170-911
Massachusetts Institute of Technology
Sloan School of Management
Cambridge, MA 02139

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TR-6 Lotte Bailyn. Problems and Opportunities for the Maturing Engineer. June, 1982.

PROBLEMS AND OPPORTUNITIES FOR THE MATURING ENGINEER

BY

LOTTE BAILYN

TR-ONR-6
JUNE 1982

Problems and Opportunities for the Maturing Engineer*

Maturing engineers in industry are caught in a dilemma: whether to remain involved in the technical work for which they were trained, or to leave that work and shift to management in accord with the typical pattern of successful industrial careers. It is a dilemma that emerges out of the disjunction between two different sets of expectations about engineers' careers, one created by their education and their own early inclinations, the other by the environment of their employment. The first set of expectations assumes that engineering in itself can be a satisfactory life-long career, that design and development -- technical problem-solving of all kinds -- can and will provide challenging and rewarding work for all of their working lives. This set of expectations usually survives only through the first few years of industrial employment, and then founders on the realities of organizational life. For in their employing companies, engineers confront a different set of expectations -- captured by the folk wisdom embodied in the assumption that "an engineer who is still an engineer at 40 is a failure" -- which leads them to believe that to be successful in engineering means to leave it.

Each set of ideas has its own proposed resolution of the career conflict that engineers face as they mature. For the first, the

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*This paper is based on a presentation at Electro/82, May 25, 1982, Boston, Massachusetts. The research on which it rests was supported in part by the Office of Naval Research under contract N00014-80-C-0905; NR 170-911.

solution is continuing education in the form of technical updating courses. And indeed there are times when formally presented information on a new technology is exactly what is needed by an engineer. But continuing education often fails as a solution because it ignores the fact that most engineers learn best by doing. As one engineer in circuit design put it when I interviewed him about his work, "Asking questions [on the job] is the only way to learn. What I need to know can't be learned by means of a text book. It is based on experience, on trying out. ... I have taken some courses, but I find that I can do as well on my own when it is something I need to learn."

Research has shown that if assigned to a project requiring new knowledge, most engineers will pick up the knowledge and techniques required by a combination of watching and of talking to others more knowledgeable; and will use papers and formal instruction only when these more direct and informal modes fail.[1] Further, for such formal instruction to be effective, the need to know must come first. And this means that engineers must be assigned to projects that require them to learn, and not only to those with which they are familiar, a policy of work assignments that is seldom followed for engineers beyond the initial years of their employment.

The resolution of the engineer's conflict that emerges from the second set of expectations -- from what one might call the "industrial myth" of engineering careers -- is simply the acceptance of a move away from engineering itself and into supervision and management. But this is not an appropriate solution for all, since research has shown that engineers develop, as they mature, a number of different orientations.[2]

Some, of course, want to go into management and have the necessary competence to do so successfully. But not all. Many others continue to be challenged by technical problems, and there are also some who shift their life orientations away from the job altogether, toward family, recreation, and avocation. All can remain productive employees if given the chance. The problem is that often they are not in fact provided with the right opportunities.

It is interesting to speculate, given the realities of engineering careers, why these two "myths" -- these two opposing sets of expectations -- persist. The reason, I think, is clear. Two groups of people, different in their own inclinations and responding to the norms of entirely different work settings, see the world in their own image. The "academic myth" is generated and transmitted by university professors who work in an environment in which their expectations are realistic, an environment where continuing high-level technical work is expected and brings the highest rewards. But in the typical industrial environment the highest recognition and greatest rewards go to those who do <u>not</u> follow a technical path. And this environment is shaped by the managers of organizations, and fits the managers' particular view of the world. Since they themselves have succeeded in management, they assume all others want to do the same and arrange promotion and reward procedures on the basis of this assumption. Rather than appreciating and capitalizing on the variety of orientations of maturing engineers, they tend to view those who do not successfully make the move to management as secondary figures and assign them to familiar, routine tasks.

Both the "academic" and the "industrial" myths are partially true for some engineers at some points in their careers. But neither suffices to define the policies and procedures necessary to ensure satisfactory and effective life-long careers for all trained engineers. Ironically, they are particularly inappropriate for those maturing engineers who continue to be intellectually involved in technical issues and challenged by bench-level work.[3]

A proper solution to this common career dilemma rests initially on engineers themselves. They must be aware of what their personal orientations are and of what directions they want their careers to take.[4] It is in this sense that an engineer must take responsibility for his own, or her own, career. By letting others define career paths on the basis of presumed orientations, engineers contribute to the perpetuation of the myths about them. But such self-awareness is not sufficient if organizations are not able to accommodate these various orientations. It does no good for maturing engineers to reassert their technical orientation if employing companies have no way of providing them with career paths that take advantage of these talents, that allow them to enlarge their responsibilities and gain recognition and rewards for continuing technical work. Nor is it useful for organizations to promote their best engineers into management unless they provide them with training and experience in these rather different tasks. Competent engineers promoted to supervisory roles who stay so involved with the details of their technical projects that they deny their subordinates the right to do their own work do damage to themselves and to their subordinates, as well as to the projects they supervise. And even those engineers whose orientations shift away from their paid work at mid-career can be kept effective

if provided with rewards that fit their needs--often in the form of more flexible time arrangements.

It is my contention, therefore, based on my own research and that of others concerned with technical careers, that the problems of maturing engineers can be dealt with by providing more imaginative career paths than are commonly found in major firms today. It is in the way that engineers are situated in their employing organizations and in the character of the work to which they are assigned that opportunities for improvement lie.

Stagnation and the Maturing Engineer

I will take as my focus for the remainder of this paper the specific dilemma of engineers who continue to be challenged by the technical work itself. In most companies they sooner or later face, as they mature, stagnation in work and career, and the first step in approaching a solution to their problems is to understand the character of this stagnation. Four aspects of this phenomenon are particularly relevant.

1. The first critical aspect of stagnation is overspecialization. It is tempting to assign work along narrow lines of expertise. But any task, no matter how intrinsically fascinating and challenging, sooner or later begins to wear thin.[5] This is part of the phenomenon of "burn-out" about which we now hear a great deal. Further, technologies, as opposed to people, do in fact become obsolete, and narrow experts may eventually find themselves with no outlets for their skills. Hence work assignments that make good sense in the short run carry within them the seed of long-run difficulties.

2. A second aspect of stagnation, already alluded to, is lack

of recognition and rewards for technical accomplishment. Even in companies with a dual ladder, the main financial rewards and the highest status usually go to those who proceed along the managerial track. The problem is compounded for engineers by the fact that the technical ladder often serves as a resting place for technical employees who attempted but were not successful in management.

3. Lack of scope is a third area of concern. Research has shown that the performance of older technical professionals remains high if they increase the scope of their work: the area over which they have responsibility.[6] Clearly managers, as they move up the ranks, increase their scope in this way. But the supervision and coordination of other people's work is not the only dimension by which to measure scope. Purely technical aspects of work--the amount of money involved in a project, the length of time a project runs, the number of different sub-areas of a project under one's control--can also increase in scope as one matures. Without such increased technical responsibilities, the work and satisfaction of the maturing engineer will suffer. Indeed, it is only if the rungs on a technical ladder are associated with such changes in the scope of technical tasks, that the dual ladder has any chance of working.

4. A final aspect of stagnation is lack of discretion. Engineers are not autonomous scientists eager to define for themselves the problems they work on. But as they gain experience and mature they do want to be able to monitor their own work and to have control over, and be accountable for, the implementation of their assigned tasks.[7] With maturity, they want to be treated more as professionals and less as technicians. What is a proper mode for an engineer first entering

a company must shift, if stagnation is to be avoided, as the engineer matures.

These four--overspecialization, lack of recognition and rewards, lack of scope, and lack of discretion--are the main components of the feeling of stagnation that so commonly overcomes the mature engineer. It is the feeling of having no place to go, no development to look forward to, of being stuck in an unchanging niche, that constitutes the main problem for these key technical professionals and is the key problem of the management that directs their work.

Overcoming Stagnation

If my analysis of the phenomenon of stagnation is correct, it points to movement as the remedy. And the movement need not necessarily be up. It can be lateral, to different organizations or projects, dealing with different aspects of technology. I was alerted to the value of lateral movements while doing research in a major R&D organization. There I found that engineers who had been forced to move to different groups because of the phasing out of specific technology looked back at this as the best thing that ever happened to them. They had been forced to learn something new and in the process had been saved from the stagnation they observed in many of their peers who had not had this experience. By generally not assigning work to mature technical employees that makes new demands on them, a manager contributes to their overspecialization and to the reduction of their effectiveness.

I have often thought, for instance, that there should be an age queue in the assignment of technical work. The newest and most challenging project should first be offered to the oldest engineer or

group of engineers.* If they refuse the assignment, it could then proceed down the age queue until it is accepted. In this way mature engineers would know that they could always have as challenging an assignment as is available, and younger engineers could look ahead and see that getting older will not necessarily mean stagnation in their work. Though I know that such a policy sounds strange--and would no doubt incur some short run costs--the long run benefits seem to me to be enormous, and would give a degree of credence to the academic myth about engineering careers.

The policy of work assignments, therefore, is critical. Emphasizing change in these assignments is the primary way to avoid the dangers of overspecialization. Though seemingly risky, such a policy is likely to increase the effectiveness of engineering work in the long run, particularly in organizations that tend to keep engineers over long periods of their careers. And such risks as there are could be minimized even in the short run by more frequent use of temporary assignments: assignments of limited time span which can be reversed, when necessary, without loss of face or status.

A further and equally critical step in defining meaningful life-long career paths for technical professionals concerns the development of appropriate systems of recognition and rewards. Four items, I believe, must be dealt with when thinking about an effective reward

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*Recent work on longstanding project groups shows that introducing new people into these groups also reduces stagnation and improves performance.[8]

system for technical professionals. It must include rewards that 1) are related to a person's work; 2) are in part at least financial; 3) involve public signals of status; and 4) confer benefits or perquisites individualized to the particular case.

Though the details will vary from company to company, my own research suggests that the most important work-related reward would be the right to report directly to a higher level of management, since this necessarily increases both the scope of work of mature professionals and their discretionary control over it.

Second, such rewards should include an increase in financial return. It is sometimes assumed that money does not motivate the technical professional (part of the "academic myth"?). But for industrial engineers there often is no other way by which to gauge their contribution to their organizations. It is the value of money as recognition that is critical for technical professionals and hence the form that monetary rewards take is particularly important. For this purpose, the usual merit reward of a small addition to the rate of annual increase based on changes in the cost of living, is probably least effective for maturing engineers. Organizations rightly decrease the rate of increase of older employees, since they are anyway, in most cases, in the highest pay categories. But this "flattening of the curve" is perceived by employees as a signal that their performance is waning, and they respond by reducing their effort to what they perceive to be the lower contribution now expected of them. Further, since performance is variable (and will become even more so if more risky work assignments become the norm), real merit adjustments to salary would

lead to more instability in basic pay than most people or organizations could tolerate. It might be more effective, therefore, to limit salary raises to cost of living adjustments (preferably stated in numbers of dollars rather than in terms of percentages) and use bonuses and stock options as merit rewards. These would directly reflect a person's performance and could vary from nothing to occasionally even doubling a person's salary. They would represent direct and fairly immediate feedback on the value of the work of an engineer, and could reflect clearly and accurately the particular goals the organization has set for itself at any time.

The third aspect of an effective reward system consists of public signals of status, which are important because monetary rewards, in whatever form, are usually private and cannot be widely shared. They might consist of a title (if not used as a dumping ground for unsuccessful managers), a private office, or perhaps increased access to secretaries and technicians. A particular assignment also--dealing, for example, with organization-wide or even environmental technical issues--could be used as a form of public recognition for high level technical work.

Finally, individualized benefits recognize the legitimacy of varying orientations at mid-career. They might relate to work (being allowed to attend an extra conference or to take a work-related sabbatical, for example), or to opportunities for relocation (another form of movement and change), or to support for reduced time commitments or early retirement.

Such career paths, based on changing assignments accompanied by

appropriate recognition and rewards when successfully completed, must exist alongside the managerial career path that is now dominant. Providing such multiple career patterns will require imaginative and flexible procedures, which must not be seen as distractions to organizational efficiency. On the contrary, such variety and flexibility are necessary ingredients for the productive deployment of the maturing engineer.

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